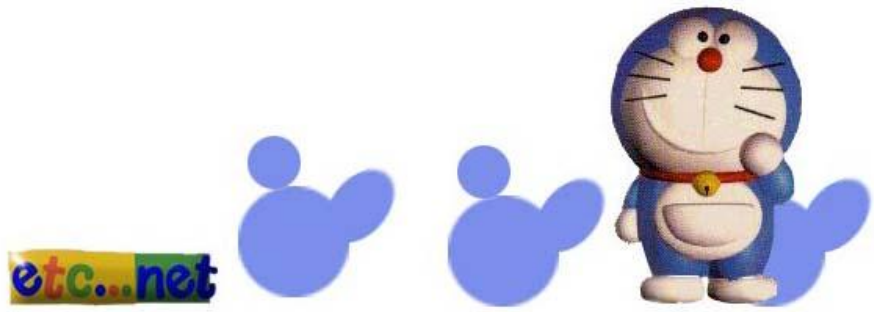
Autotransplantation of Teeth



Tooth Transplantation

- Autogenous transplantation
- Isogenic transplantation
- Allogenic transplantation
- Xenogenic transplantation

History

- Slaves in ancient Egypt were forced to give their teeth to their pharaohs.
- Opera Chirurgica Paris (1594)
- First well documented by M.L. Hale (1954)

J Calif Dent Assoc. 2009 Jan;37(1):32-5.

Autotransplantation of Teeth

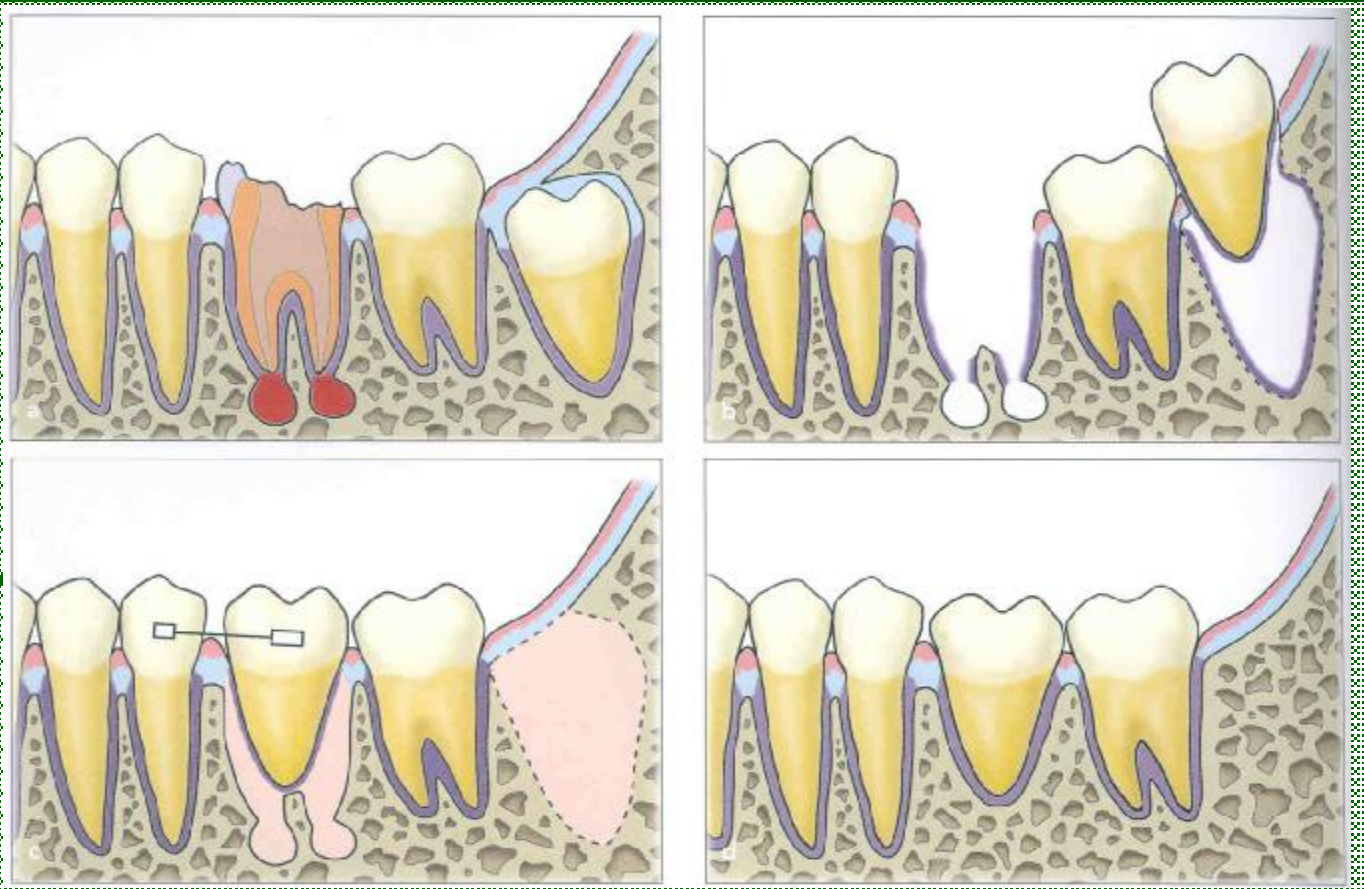
Definition

The surgical movement of a tooth from one location in the mouth to another in the same individual

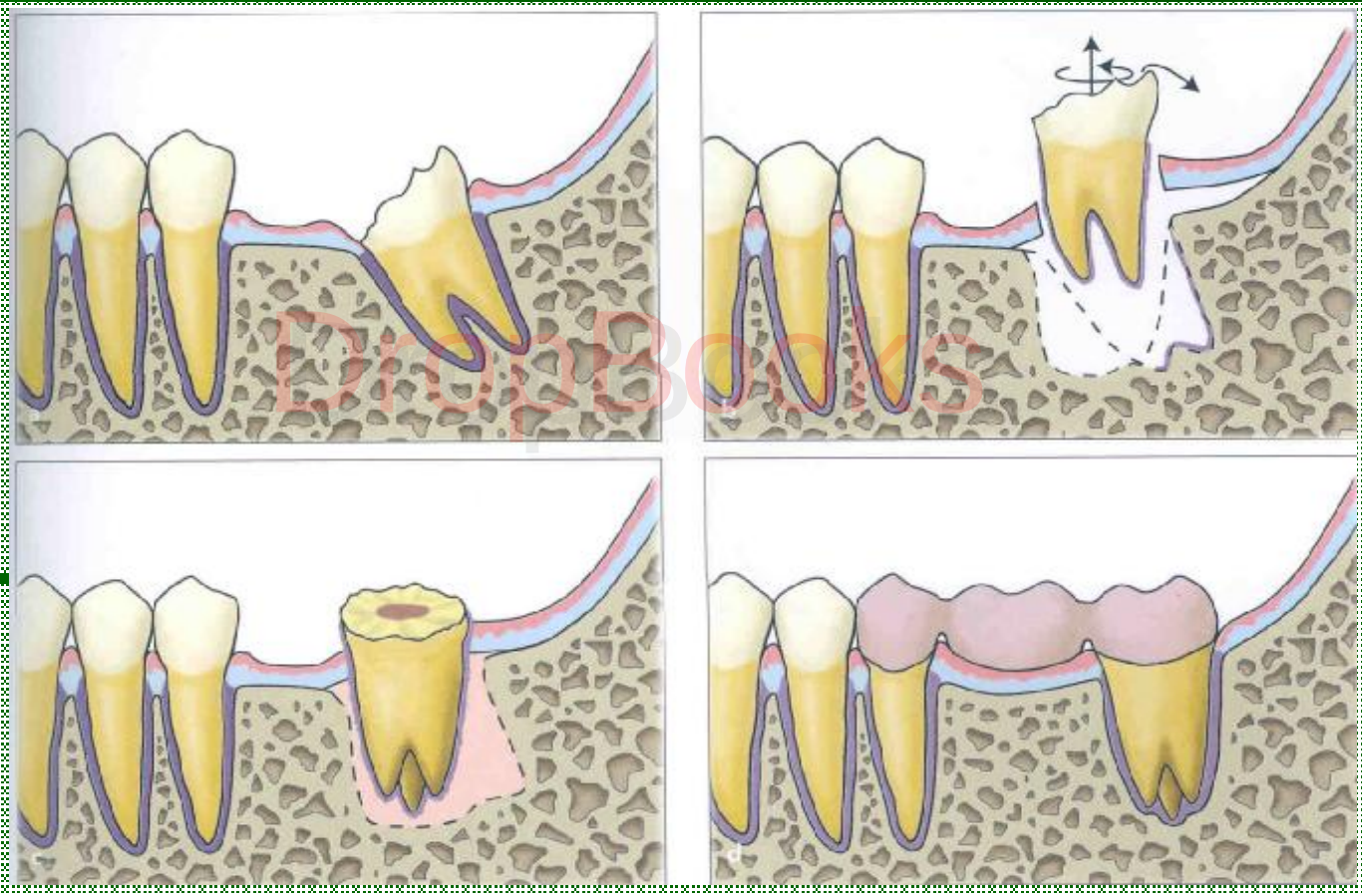
Classification

1. Conventional transplantation
2. Surgical upgrighting
3. Surgical extrusion
4. Intentional replantation

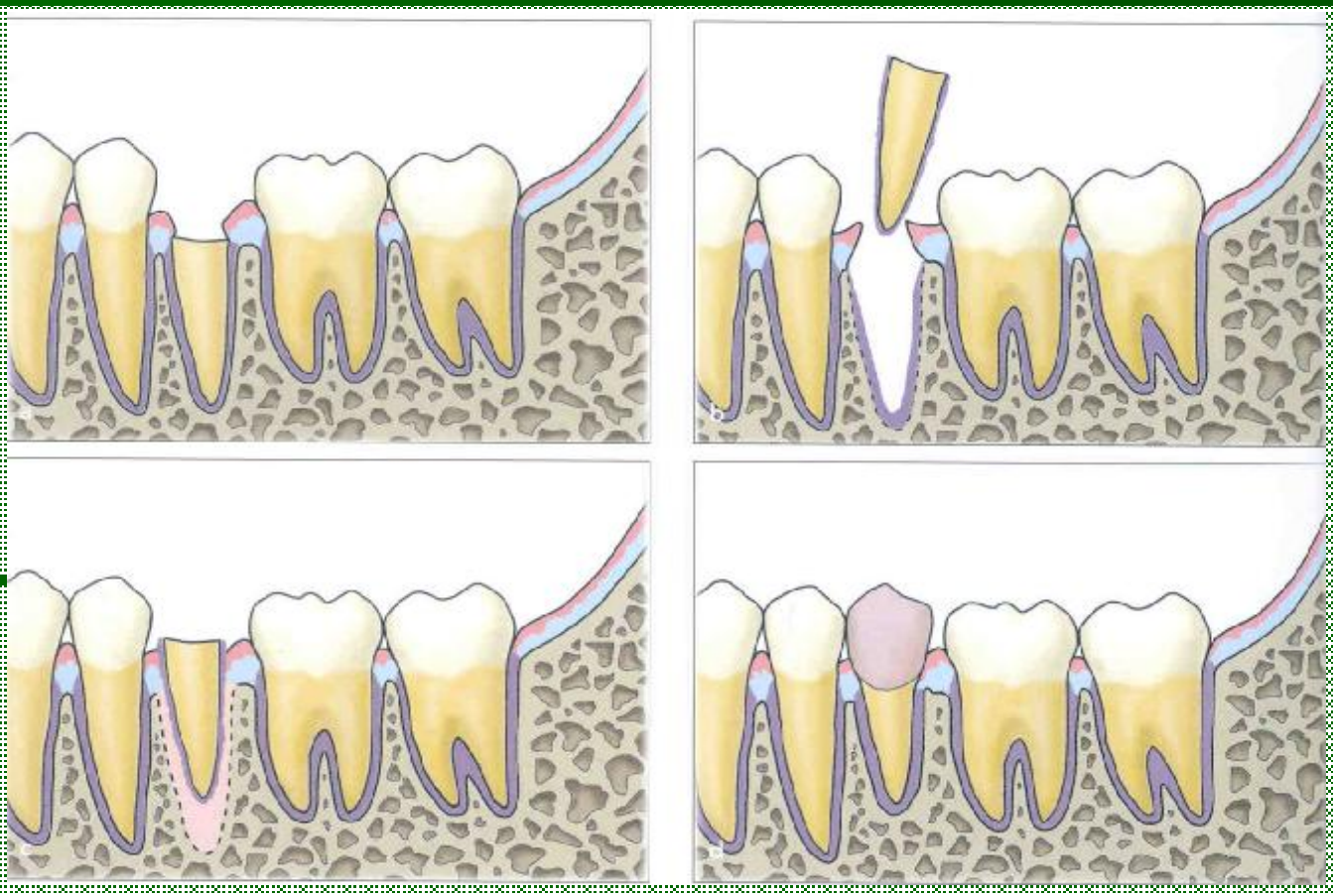
1. Conventional transplantation



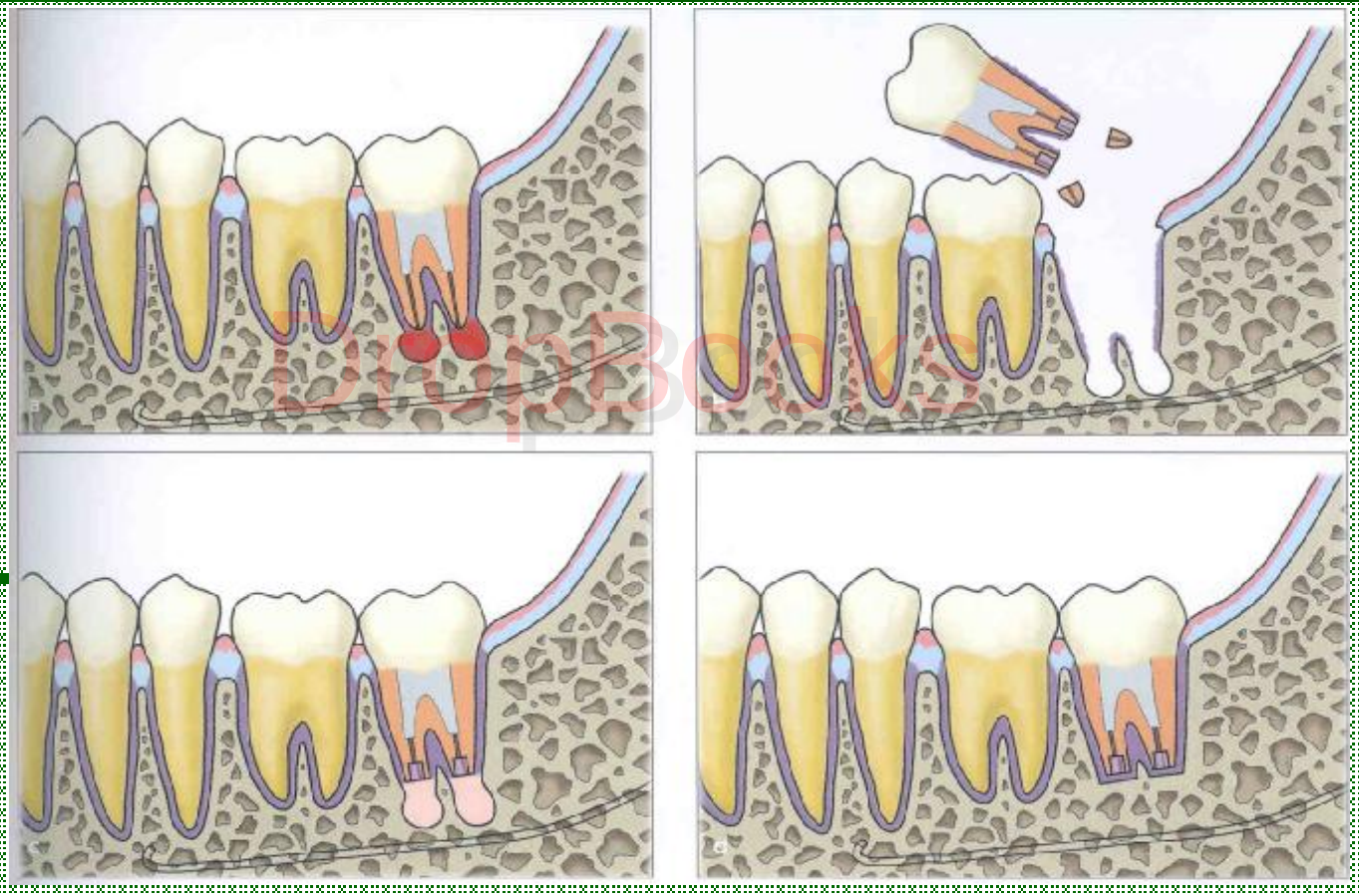
2. Surgical uprighting



3. Surgical extrusion



4. Intentional replantation



Indications

Conventional transplantation

- Unrestorable tooth

- Malposition or impacted tooth

Patient factors

- No major systemic problems
- Younger patients without metabolic disease

Donor tooth factor

- Non functional tooth
- Appropriate root form
- Developing root should be at stage 4 or 5

-Lower stage 4 : underdevelopment
-More than stage 5 : pupal healing may not be expected

	Stage 1	Beginning of root formation
	Stage 2	¼ root formation
	Stage 3	½ root formation
	Stage 4	¾ root formation
	Stage 5	Complete root formation, apical foramen is wide open
	Stage 6	Complete root formation, apical foramen is half closed
	Stage 7	Complete root formation, apical foramen is nearly closed

Stage of root formation

Ideal shape of root

Smooth conical single root

Shape of root

- Very large roots
- Widely spread roots
- Curved roots

- Trauma to PDL
- Procedure more challenging

Shape of root

- Short root trunks : develop periodontal pockets at the furcation area after transplantation
- Multirooted teeth with enamel projection or periodontally involved teeth with attacchment loss of more than one third of roots are

: ***Contradicated***

If more than two teeth are available for transplantation

- Depend on shape of crown
- Mandibular third molars are more similar to other mandibular molars than maxillary third molars

Recipient site factor

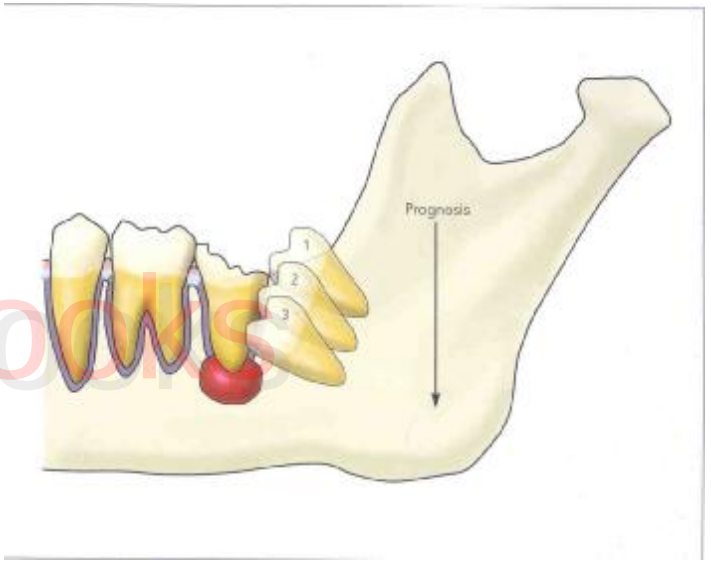
Ideal : ⇨ enough width and height

⇨ PDL still attached after extraction

⇨ Transplantation should occur within 1 day to 1 month

Recipient site factor

Prognosis depends on the position of the third molar.



: more apically more difficult to gain attachment in the distal area

Indications

Intra-alveolar Transplantation

- Should compare to minor tooth movement
- If case involve more than two factors below :

  - *Proper root form*
  - *Pulp vitality*
  - *Difficulty with orthodontic appliances*

Intra-alveolar Transplantation

Indications (Cont.)

- *Require rotational movement*

- *Time and cost*

- *Requires definitive diagnosis of traumatized teeth*

Indications

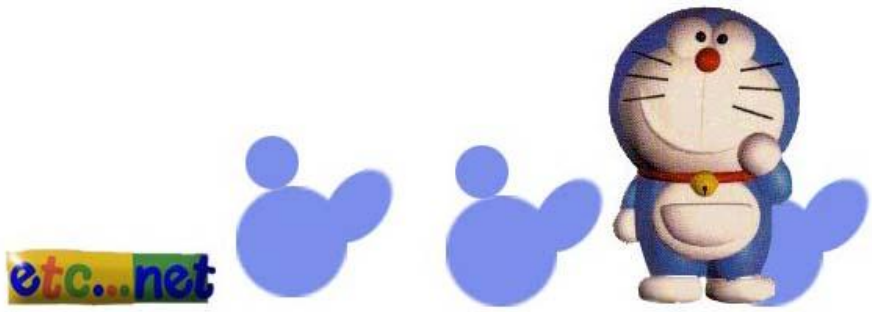
Intentional Replantation

- Last treatment option for lesions of endodontic origin (LEO).
- In case of suspected root fractures

Autotransplantation Relative to Various Dental Discliplines

- Prosthodontics
- Orthodontics
- Pediatric dentistry
- Endodontics
- Operative dentistry
- Periodontics

Sequence and Treatment Procedures

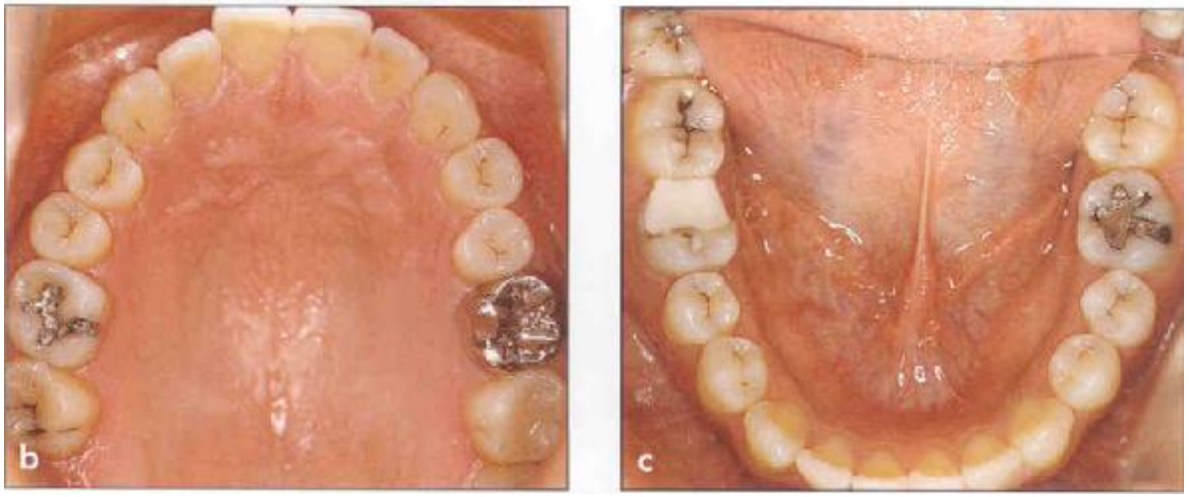


Examination and Diagnosis

- Clinical examination
- Radiographic examination
- Analysis of donor tooth and recipient site

Treatment Planning

Oral hygiene instruction



Treatment Planning

(Cont.)

- Tooth extraction from the recipient site
- Timing of root canal therapy
- Orthodontic treatment
- Restorative treatment

Surgical procedure

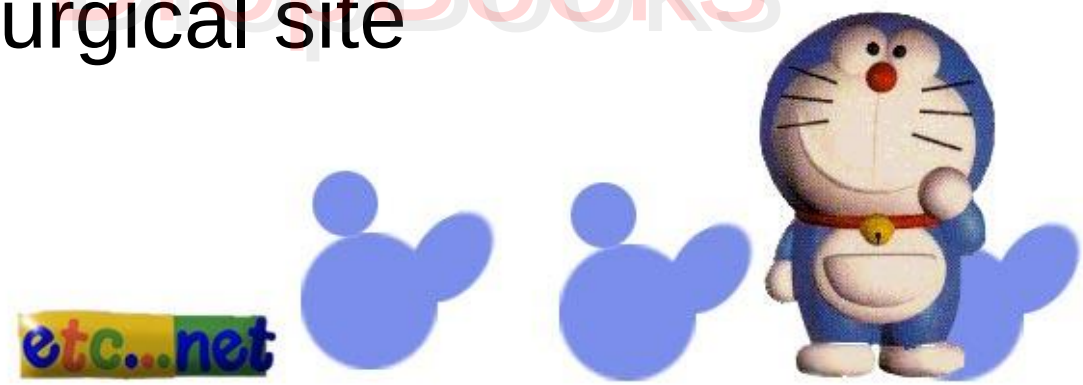
Conventional Transplantion

1. Setting up instruments

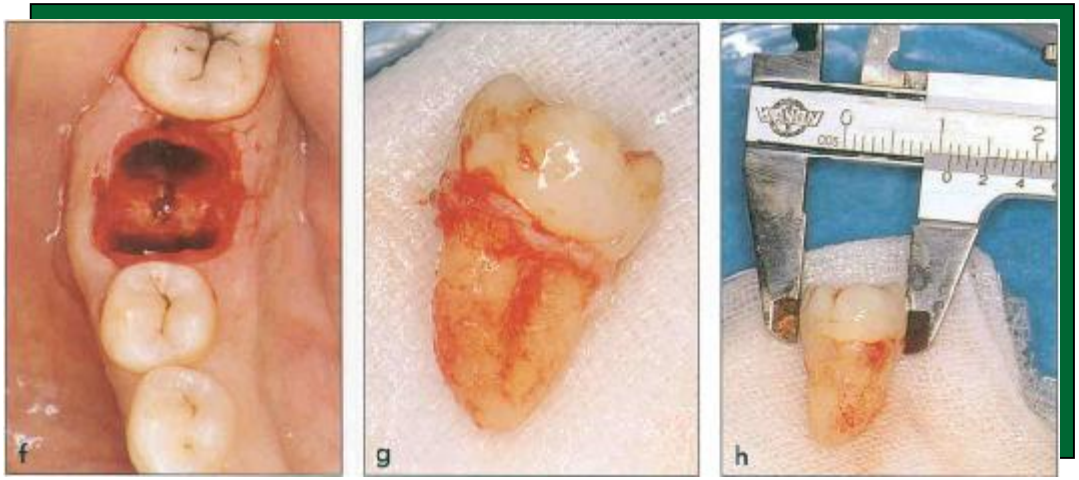
DORAEMON

2. Prepocedure administration of antibiotics

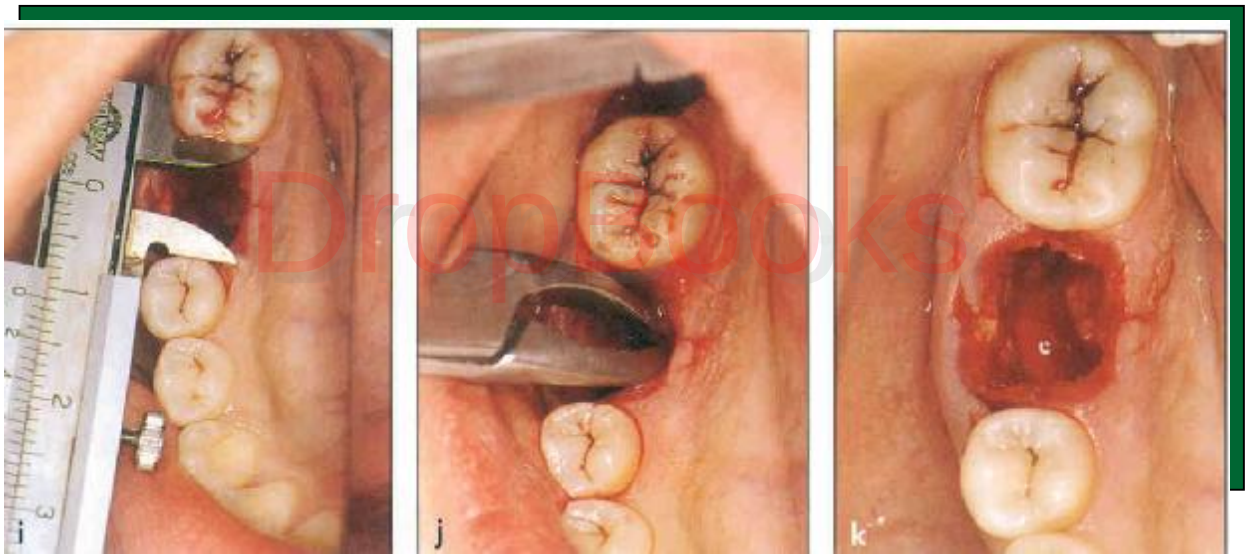
3. Disinfection and anesthesia
   of the surgical site



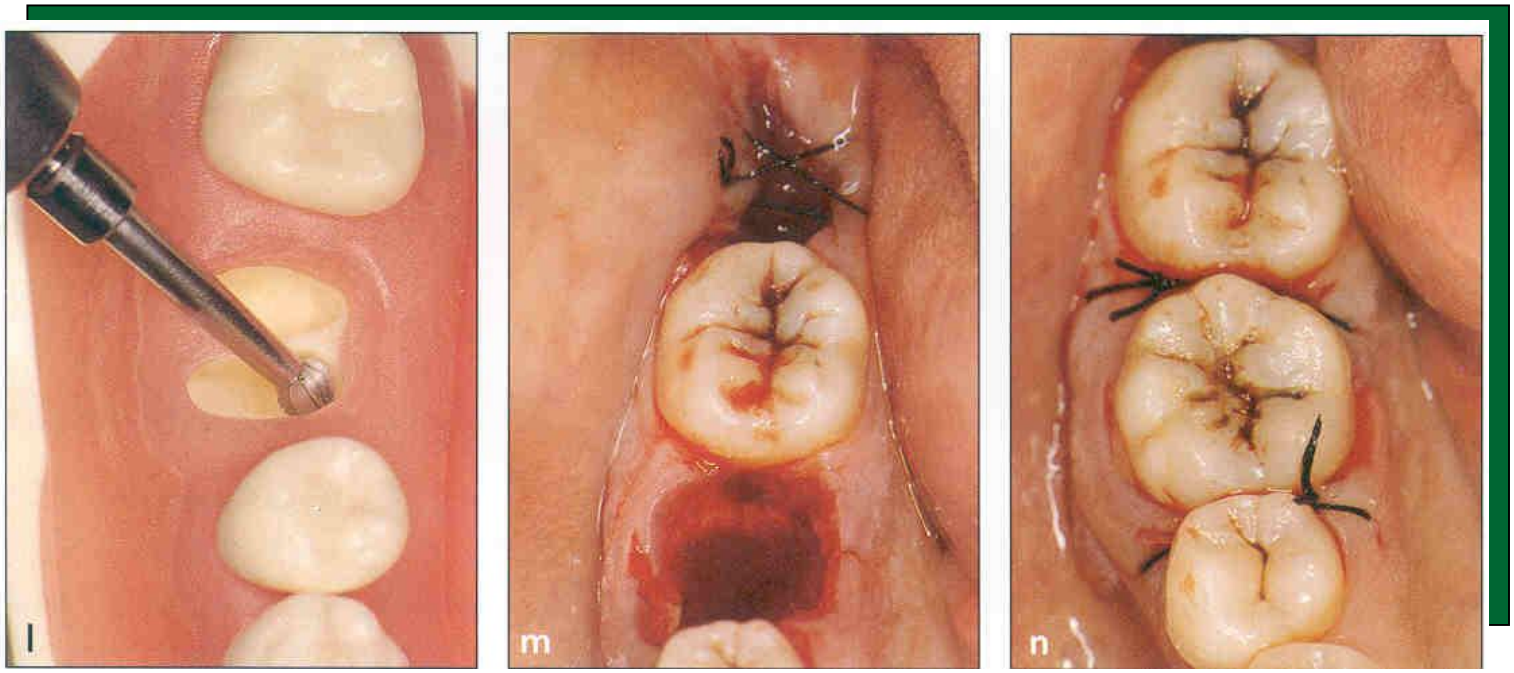
4. Extraction of tooth at the recipient site
5. Extraction of the donor tooth
6. Measurement of the donor tooth



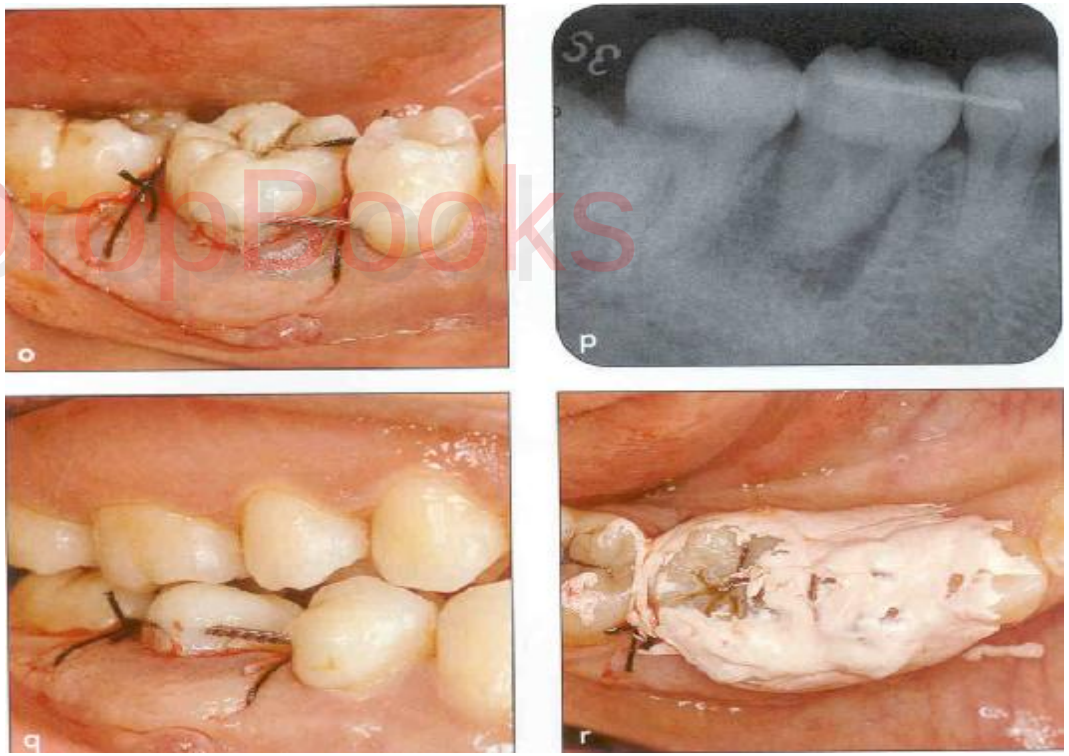
7. Evaluation of crown width and try-in
8. Preparation of recipient site



9. Try-in and plantation of the donor tooth
10. Trimming and suturing the flap

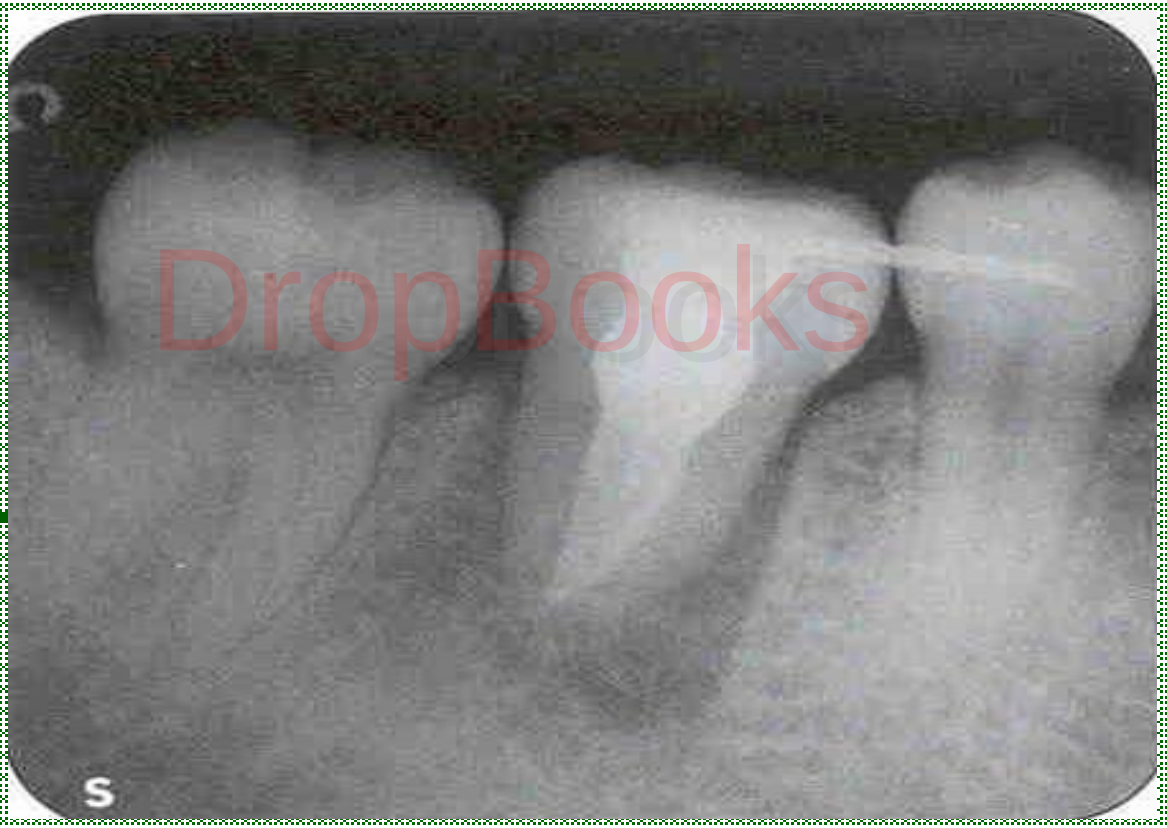


11. Fixation and occlusal adjustment of the donor tooth
12. Radiographic evaluation
13. Surgical dressing and home care instructions (including prescription of antibiotics)



14. Prophylaxis and removal of pack and suture
15. Removal of splint

Root canal treatment in transplanted teeth



Natural movement of transplanted teeth

Orthodontic movement of transplanted teeth

- Should be planned prior to surgery
- Position and height of alveolar bone can be changed
- Better to start after complete healing of the periodontal ligament (8 weeks)
- But before healing of alveolar bone
- The movement of roots out of the alveolar bone can prevent early ankylosis

Restorative treatment of transplanted teeth

- All types of restorative treatments can be applied
- Composite resin restorations are the first choice
- In developing teeth any preparation should be finish in enamel

Composite resin restoration

Maintenance

At 1, 2, 3, 6 and 12 months then yearly

Surgical procedure

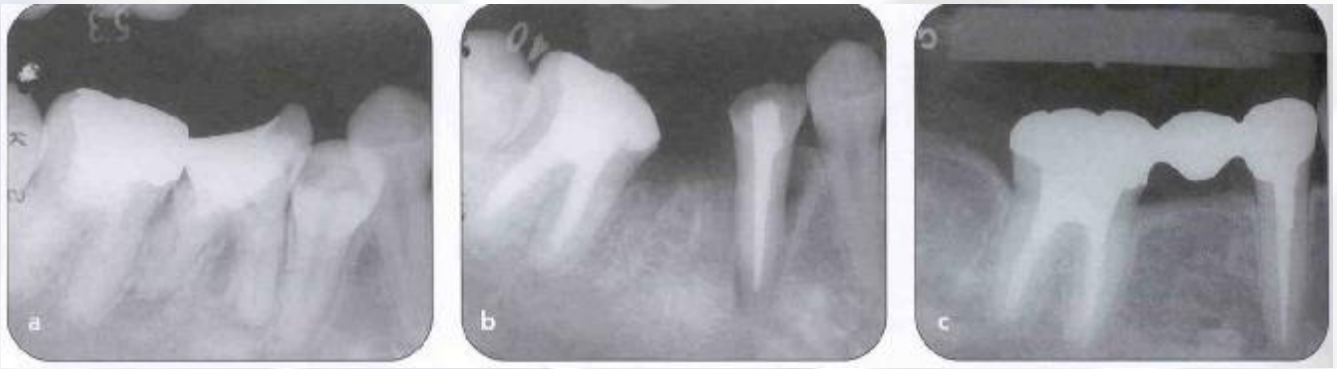
Intra-alveolar Transplantation and Intentional Replantation

1. Local anesthesia
2. Sectioning of the gingival epithelium and incision of gingival tissue
3. Reflection of gingival flap
4. Extraction by elevation
5. Apicoectomy and retrofilling

Surgical Procedure (Cont.)

6. Replantation
7. Suture and fixation
8. Surgical dressing
9. Maintenance

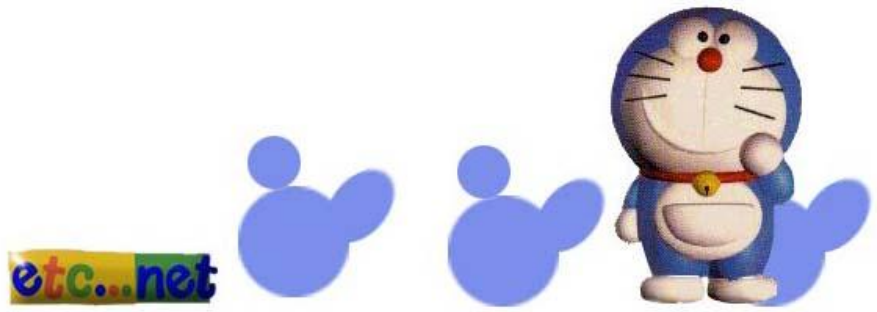
Surgical uprighting



Surgical extrusion

Intentional replantation

Transplantation of immature teeth



Five main indications

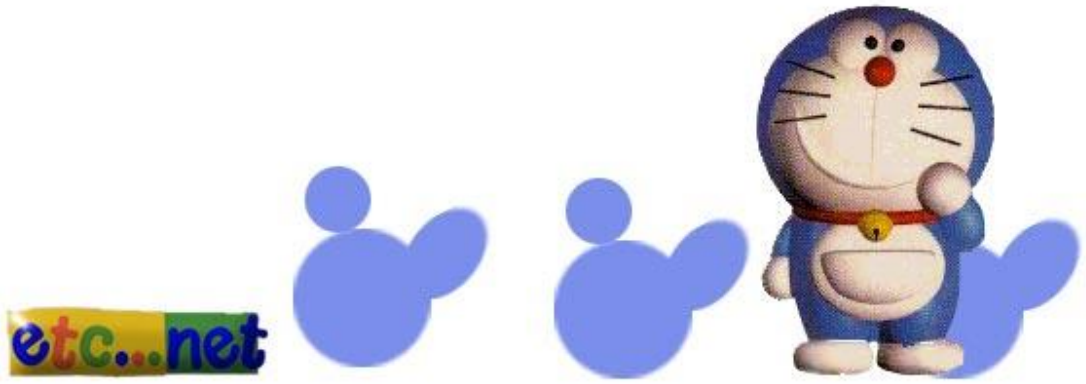
1. **Transplantation of premolar to agenesis site**

2. Transplantation of premolar to the anterior region

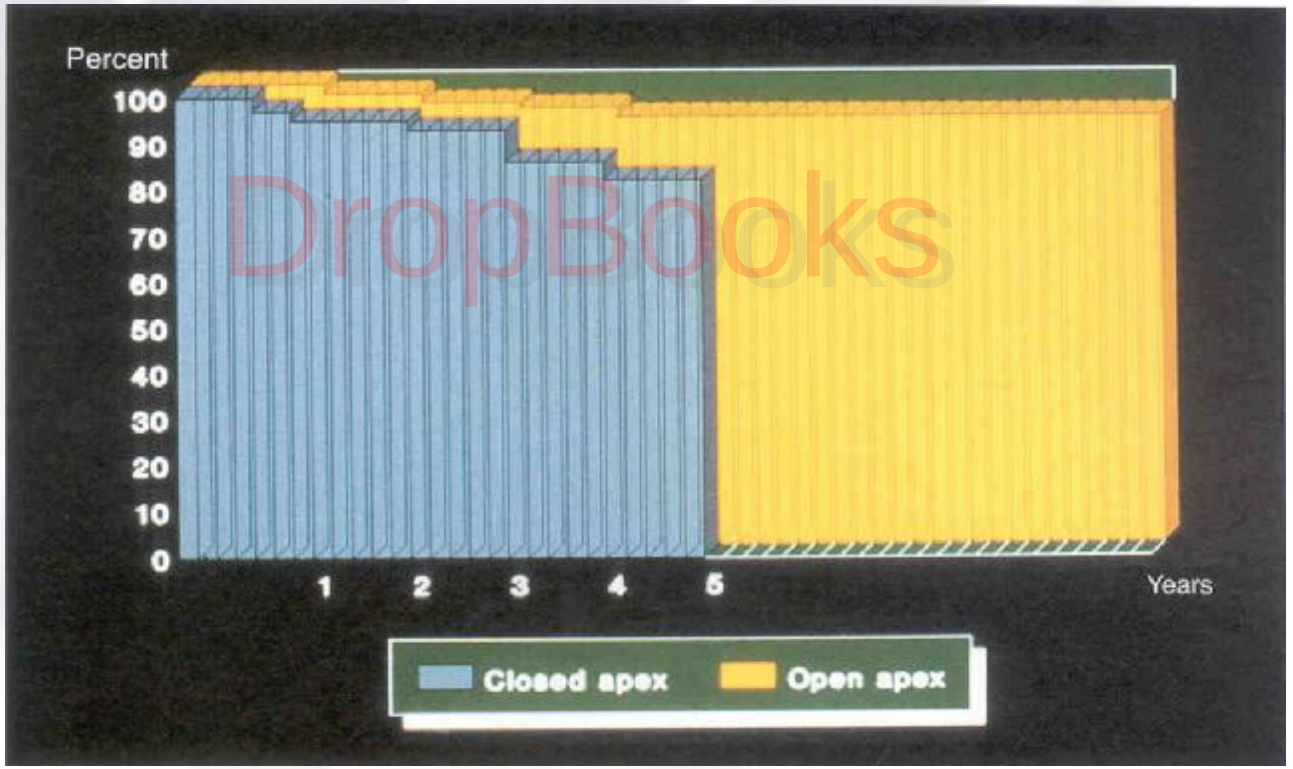
3. Surgical repositioning of ectopically positioned teeth

DORAEMON

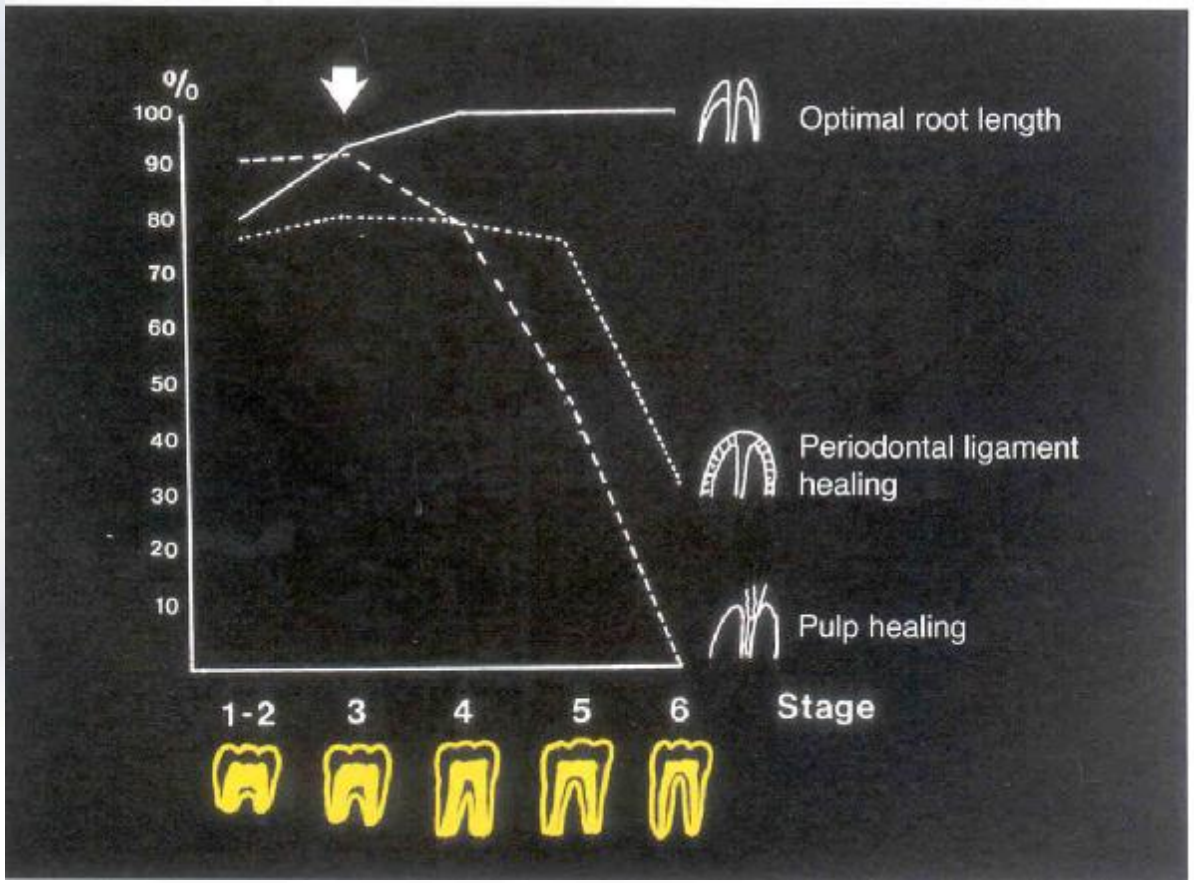
4. Transplantation of third molars to replace first molars
5. Transplantation of third molars to agenesis sites in the first and/or second premolar region



Tooth Survial after autotransplantation of molars



Risk of healing complications related to stage of root development at time of transplantation of molars

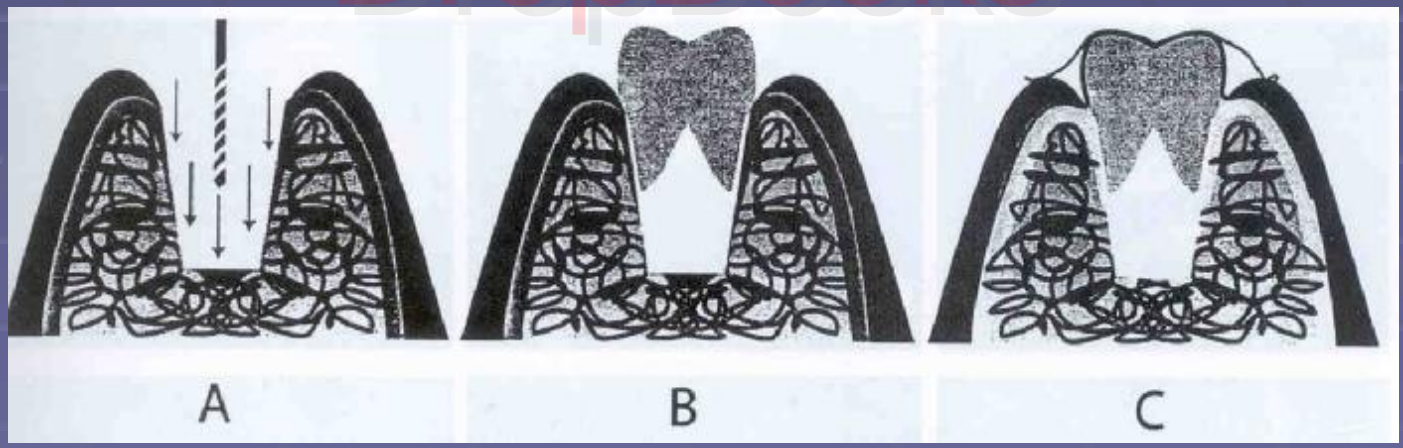


Function fixation of autotransplanted tooth germs by using bioresorbable membrane

Gérard et al

Oral surg Oral med Oral Pathol Oral Radiol Endod 2002; 94: 667-72

- Surgical procedure



Patient 1 : 19 years old

A : Before transplantation
B : 3 weeks after transplantation
C : 1.5 years after transplantation

Patient 2 : 10 years old

D : after transplant with ¼ root development
E : 1.5 years after transplantation
F : 5 years after transplantation

Patient 3 : 15 years old

G : after transplant with 1/6 root development
H : 0.5 years after transplantation
I : ¾ root development with no resorption

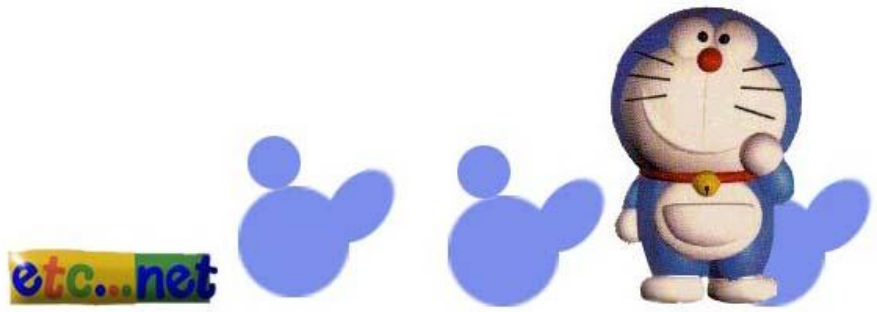
Patient 4 : 13 years old

J : after transplant with 2/3 root development
K : 1 years after transplantation
L : 4 years after transplantation

Conclusion

The transplantations of immature teeth were improved by the use of a resorbable membrane,which caused an optimal functional fixation of the transplanted tooth.

Wound Healing

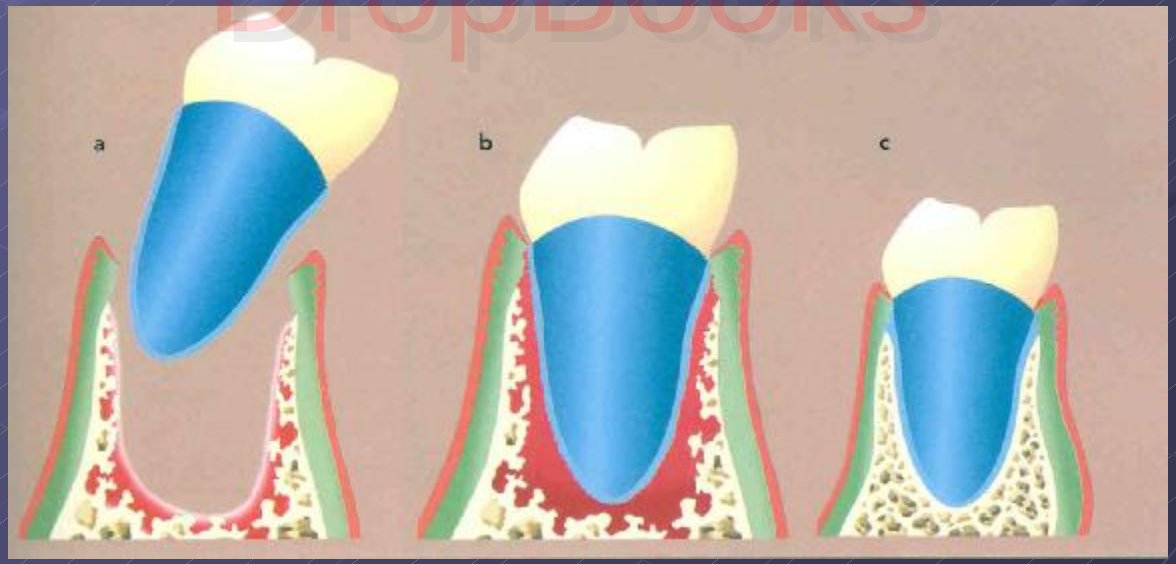


Wound healing

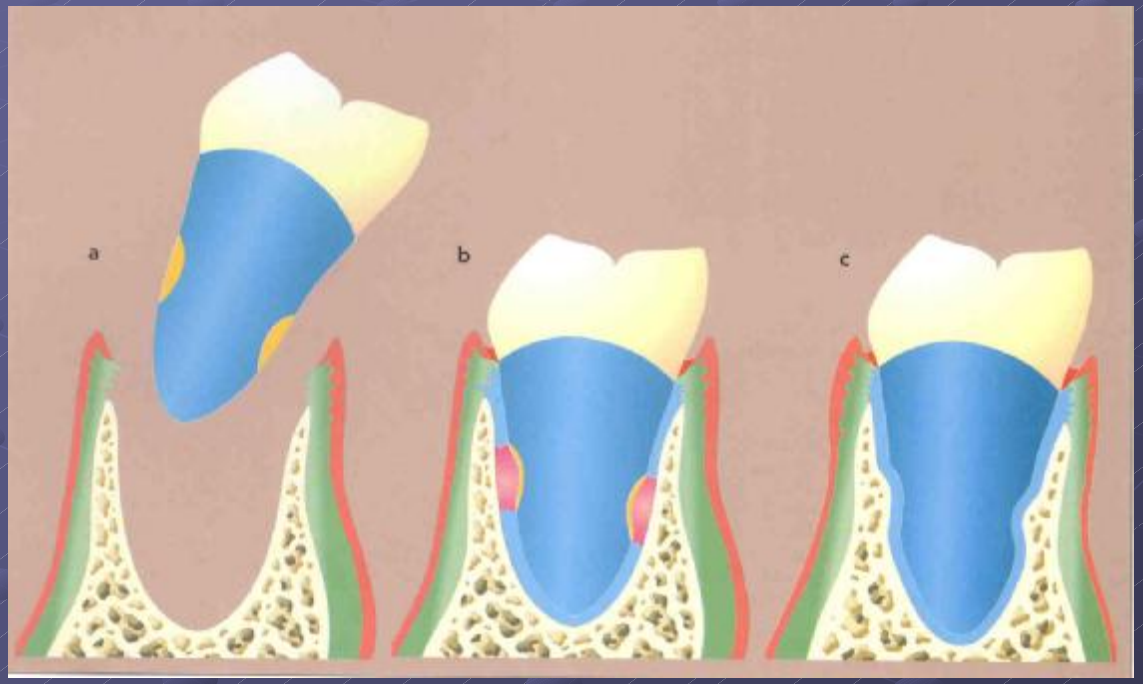
- Healing of the PDL
- Mechanism of root resorption
- Healing of gingival tissue
- Healing of the alveolar bone
- Healing of the pulp and continuation of root development

Healing of the PDL

- Depends on the presence of vital PDL
- Reattachment
  - PDL attach around the root



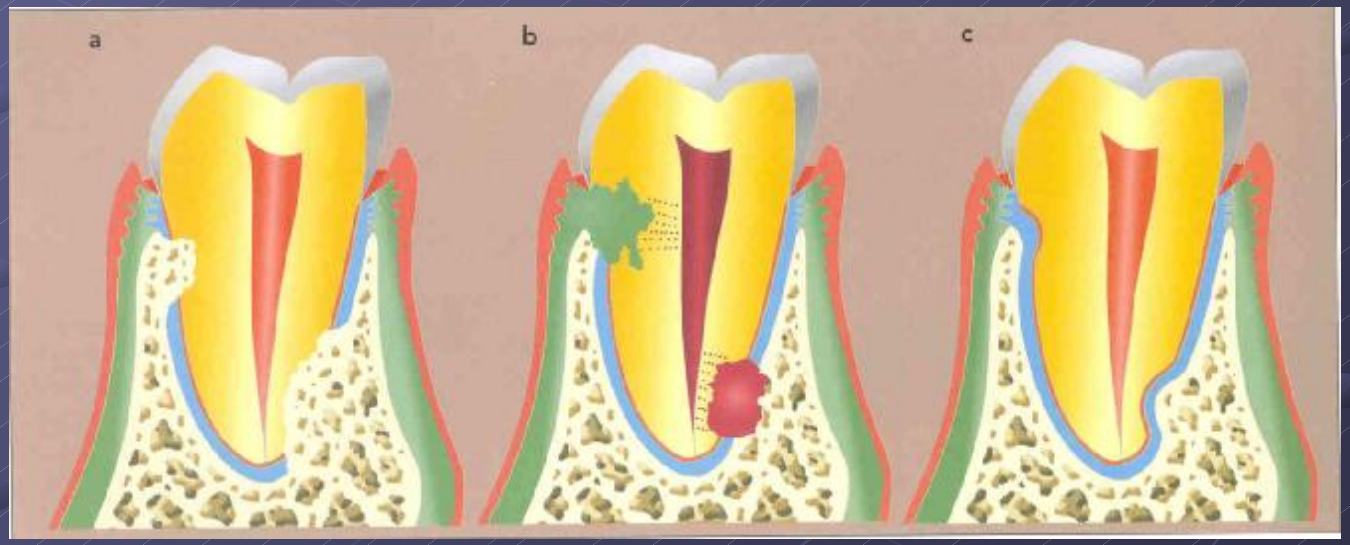
- New attachment
  - Partially missing of PDL
  - Root resorption



- Complete in 8 weeks

Mechanism of root resorption

- Failure healing of PDL
- Surface resorption (c)
- Replacement resorption (a)
- Inflammatory resorption (b)

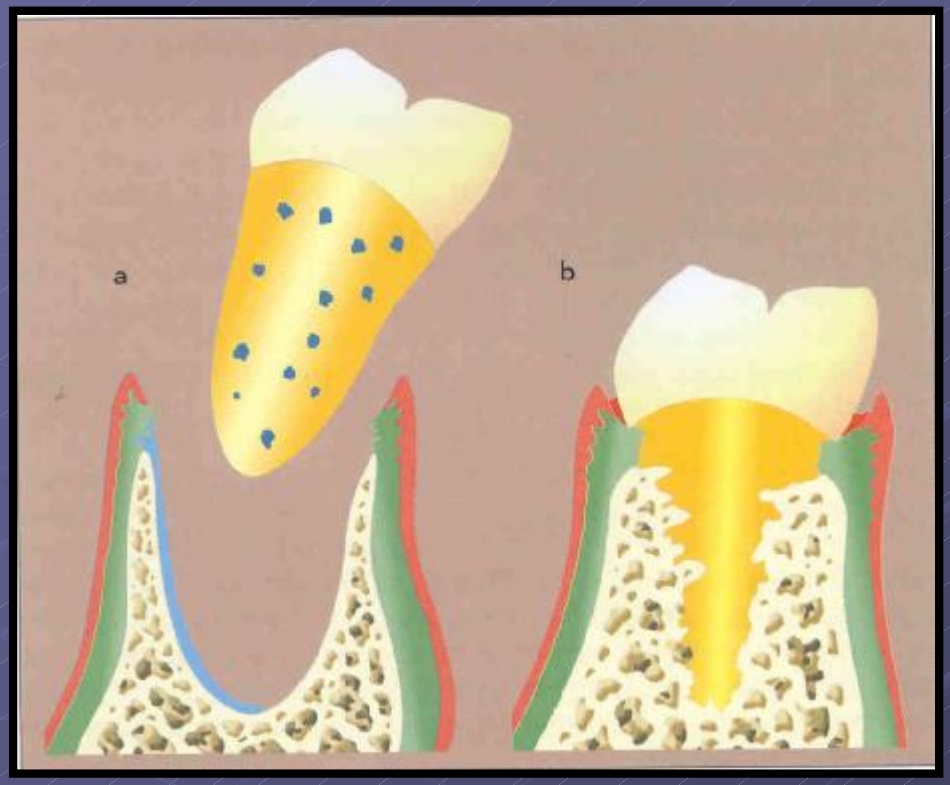


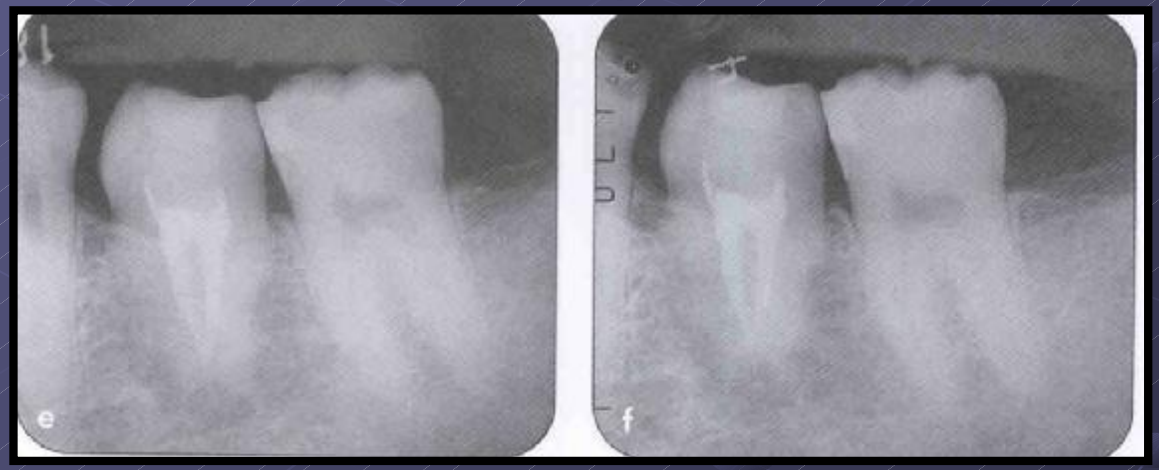
Surface resorption

- Localized mechanical damage to PDL or cementum
- Limited to surface of cementum or dentin
- Small lacunae
- Normal PDL space
- Normal percussion sound
- Can be repaired

Replacement resorption

- Ankylosis
- Extensive loss of PDL
- Root is resorped and replaced by bone
- High percussion sound
- Transient replacement resorption
- Progressive replacement resorption

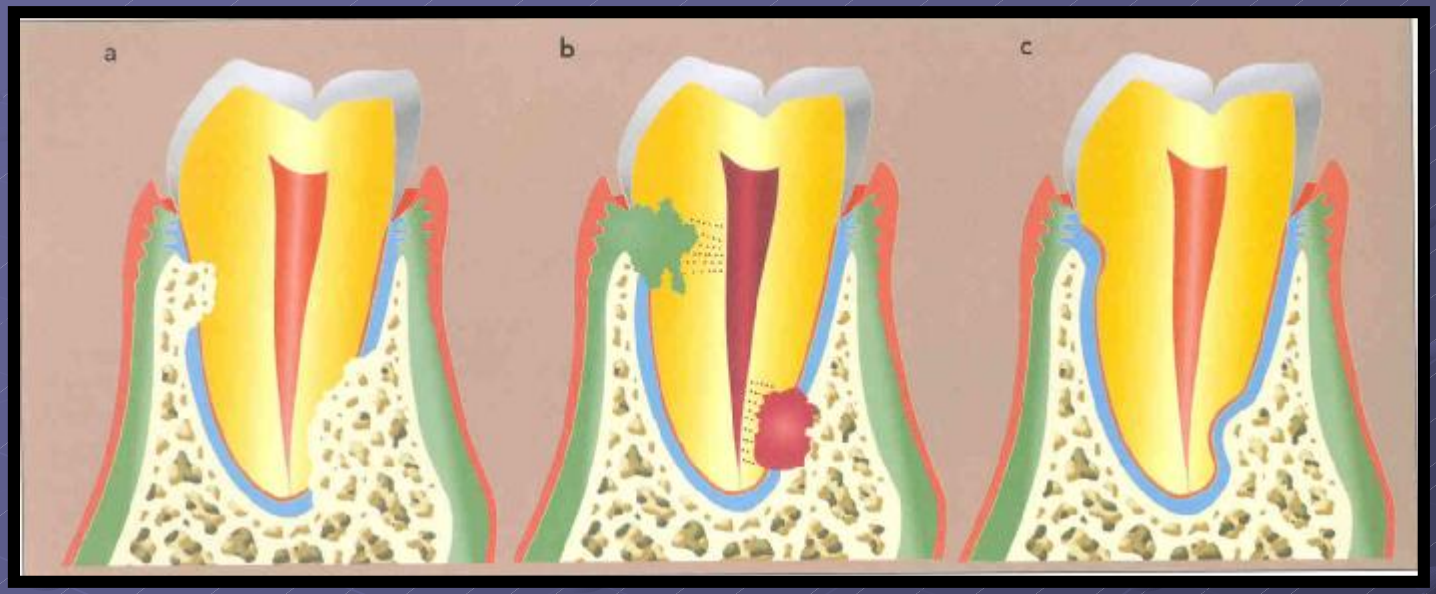

a
b

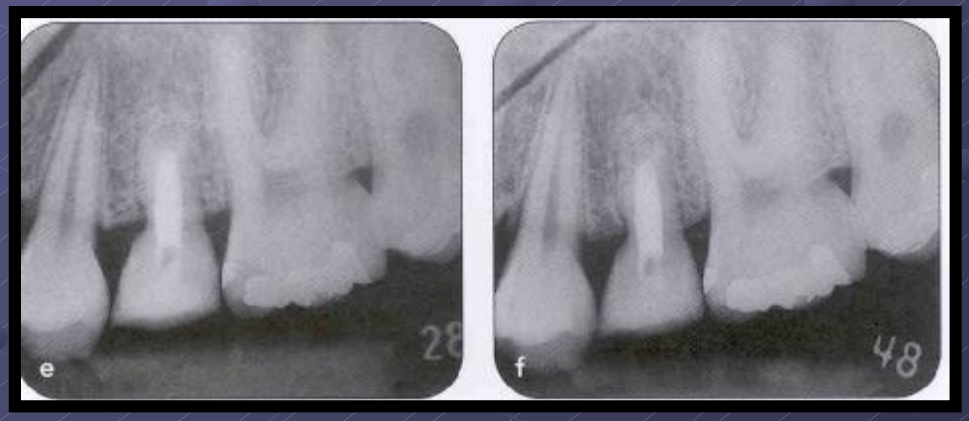

e
f

Inflammatory resorption

- Pulp infection
- Exposed dentinal tubules
- Existance of granulation tissue in resorption fossa
- Always in 6 to 7-year-old children’s anterior teeth
- Radiolucent area
- Fast in general

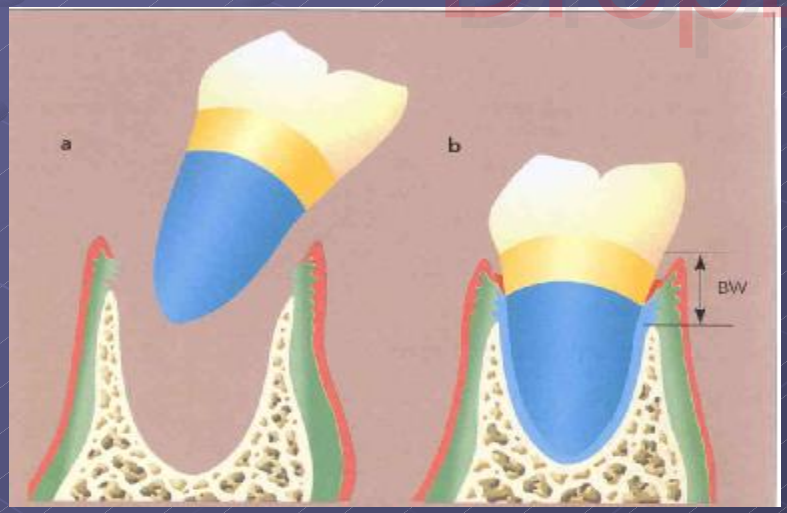
Inflammatory resorption

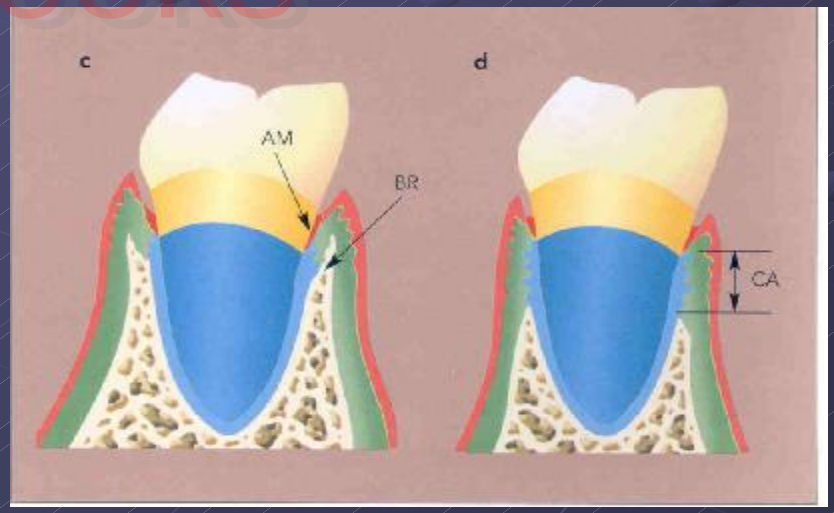




Healing of gingival tissue

- Enhanced by placing the donor tooth
- Sutured tightly in contact with the 1-mm. band of root PDL





Healing of alveolar bone

- PDL has a major role in alveolar bone formation

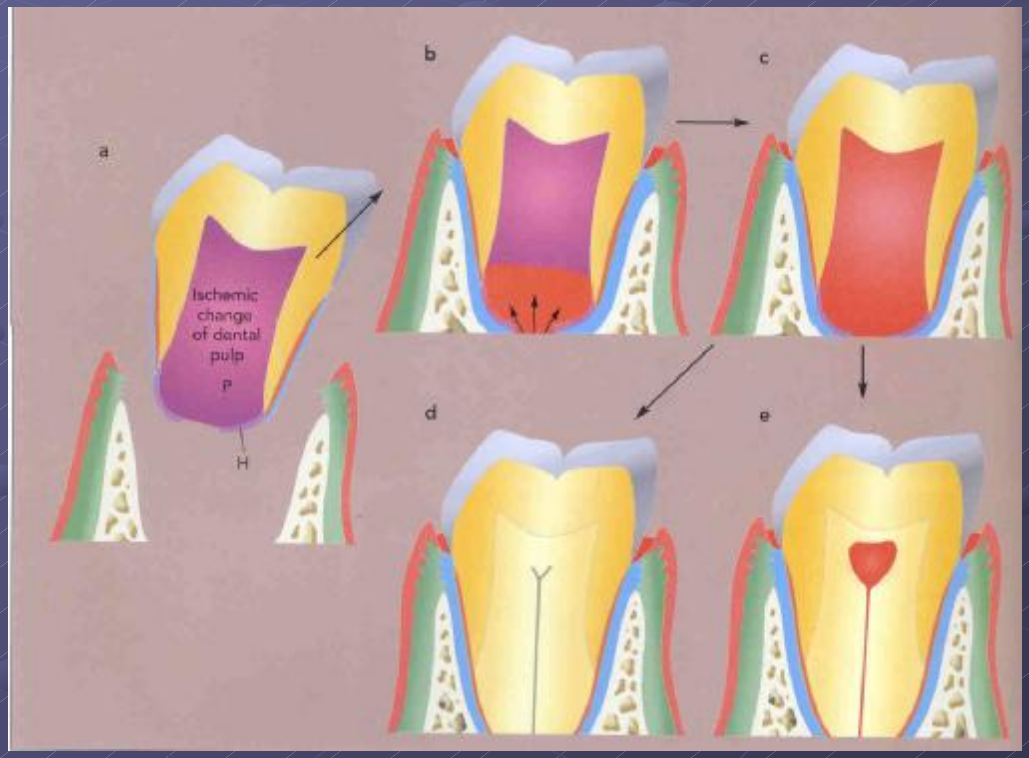
- Alveolar bone proper
  : Lamina dura
  : can be observed in several months after transplantation

- Alveolar process

: Osteoinduction
: Cannot be expected vertically or horizontally

Healing of the dental pulp and Continuation of root development

- Obliteration of the pulp canal

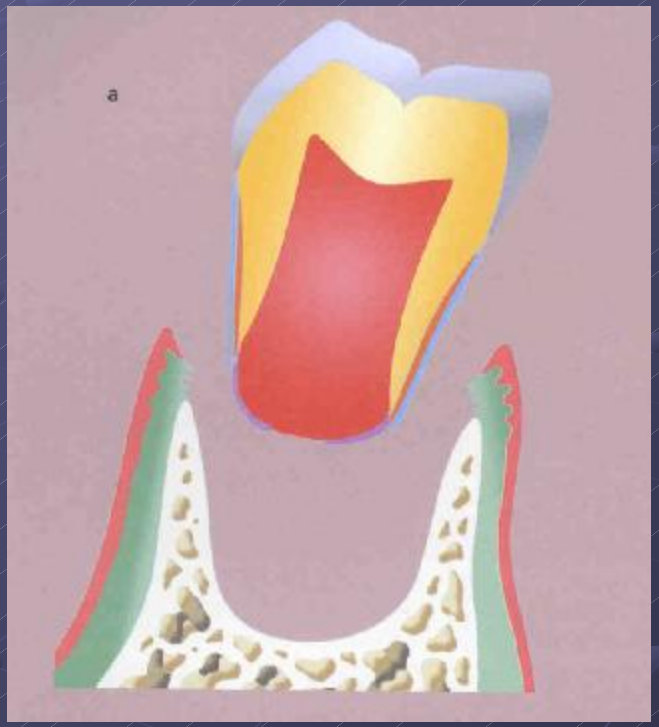


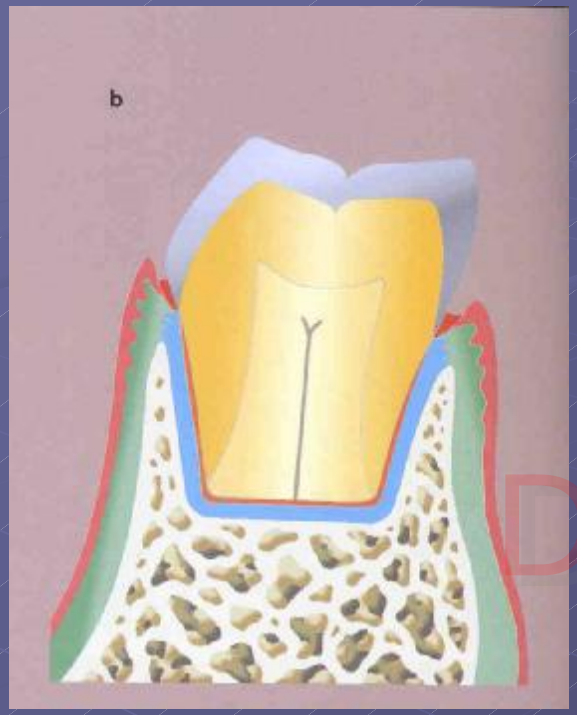
Root canal therapy in developing tooth

- Necessary when pulp does not heal after transplantation
- Apexogenesis
- Apexification
- $Ca(OH)_2$

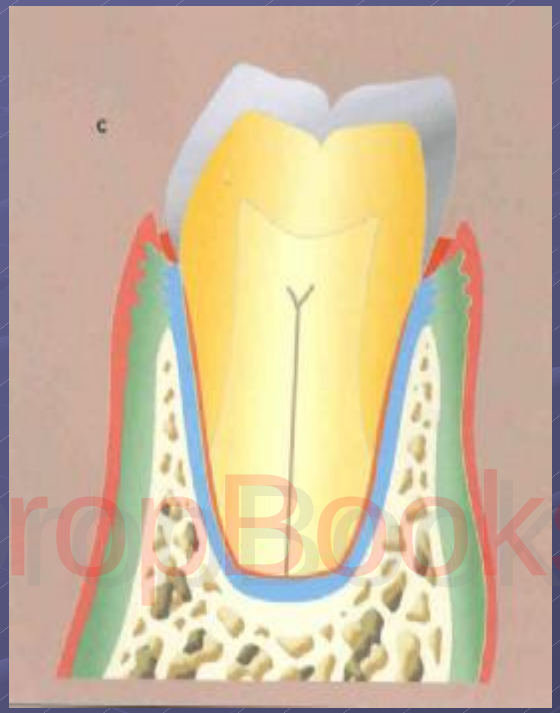
Continuity of development of dental roots

- Accompany healing of the pulp in developing teeth
- Total arrest
- Partial arrest
- Nonarrest
- Stage 4 or 5 of root

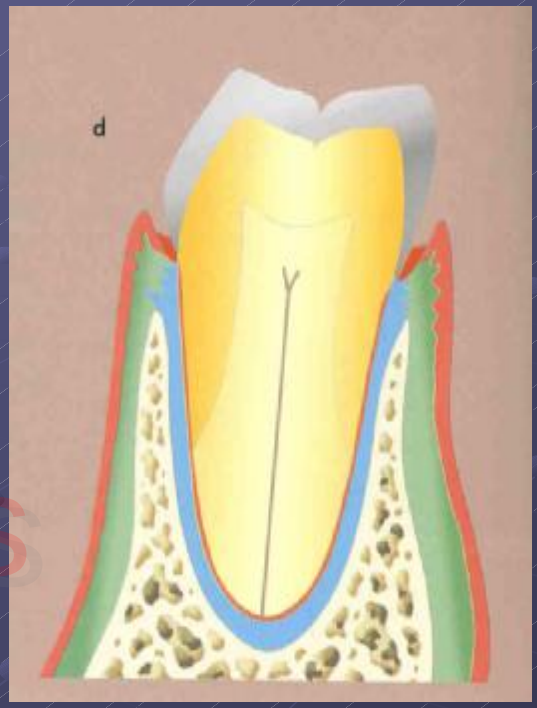




Total arrest



Partial arrest



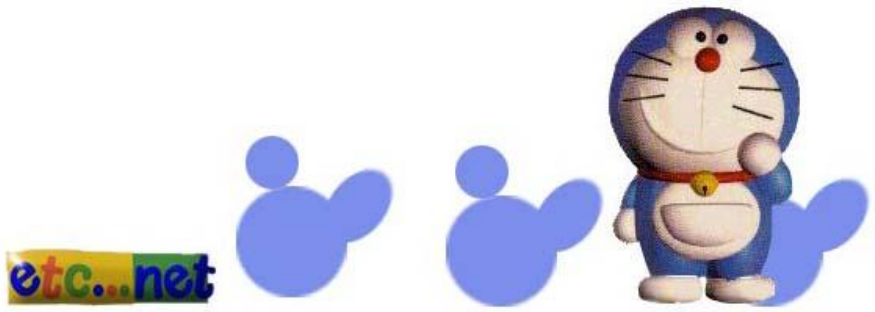
Nonarrest

EPT Response

- The EPT response subsequently increased with time and seem to be unchanged after 1 year.
- Not necessary to start any treatment in negative-EPT tooth with good clinical and radiographic result
- No significant association between EPT response and bone formation

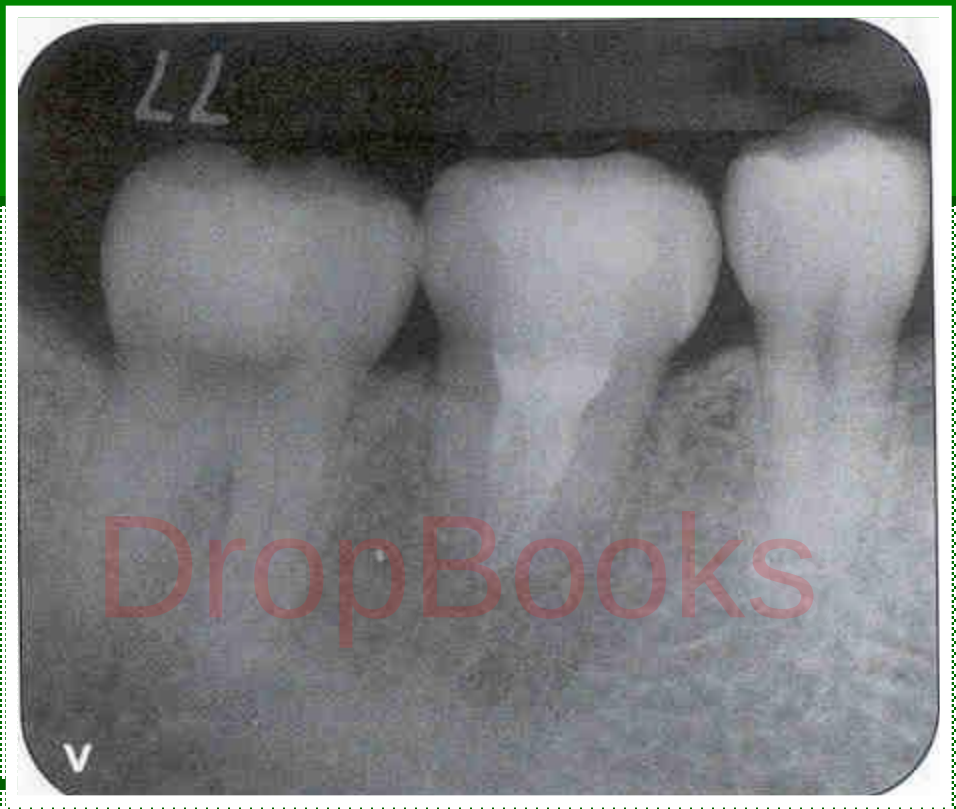
Waikakul, Kasetsuwan and Punwutikorn
Oral surg Oral med Oral Pathol *Oral Radiol Endod 2002; 94:249-55*

Prognosis



Criteria for Success in Autotransplantation

- Radiographic evidence of success
  - Normal width of PDL space
  - No evidence of progressive root resorption
  - Present of Lamina dura



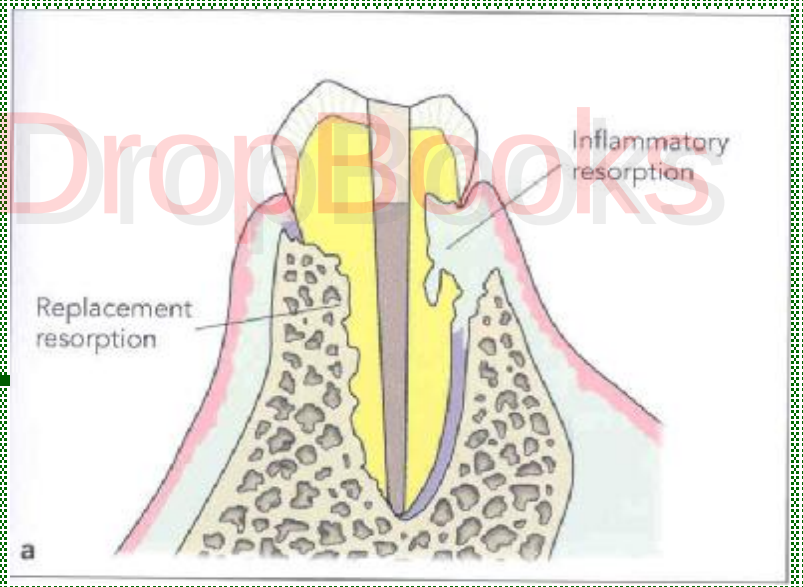
One year 3 months after transplantation

- **Clinical evidence of success**

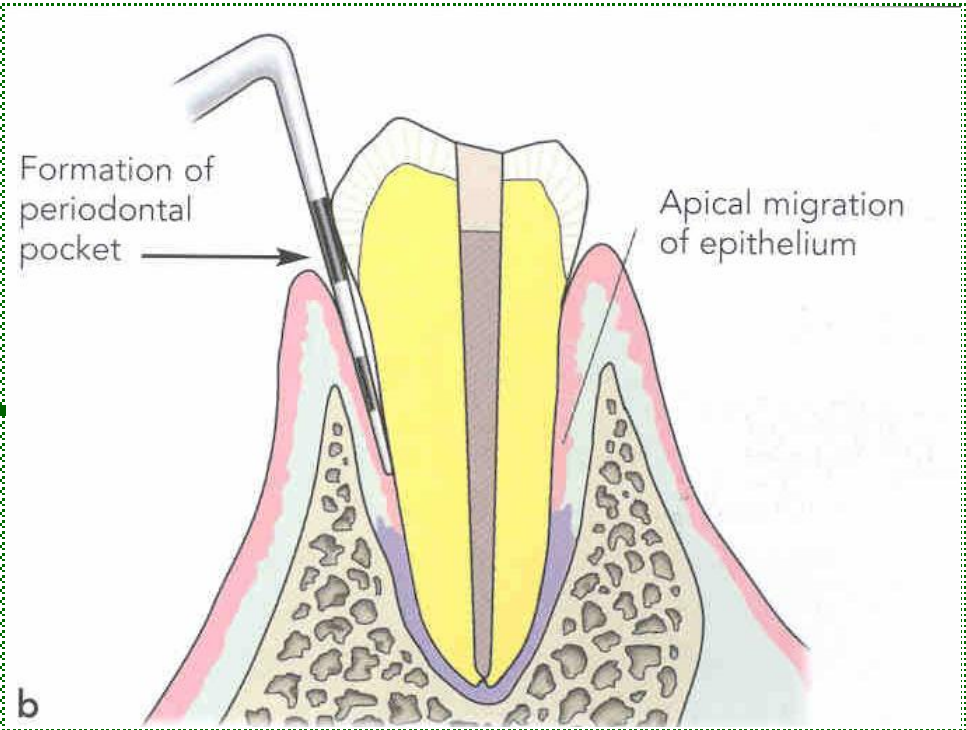
1. Tooth mobility within normal limits
2. Normal percussion sound
3. No evidence of lost attachment
4. No evidence of inflammation
5. No patient discomfort
6. Normal tooth function

Evidence of Failure

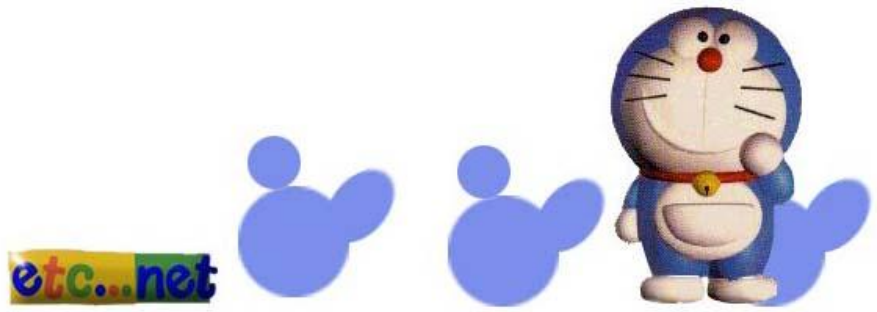
1. Evidence of progressive root resorption



2. Evidence of no attachment gain or progressive attachment loss

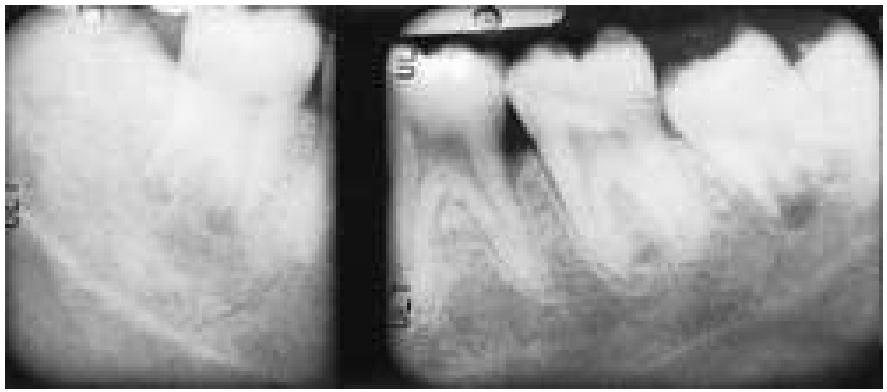


Case Reports



Case 1

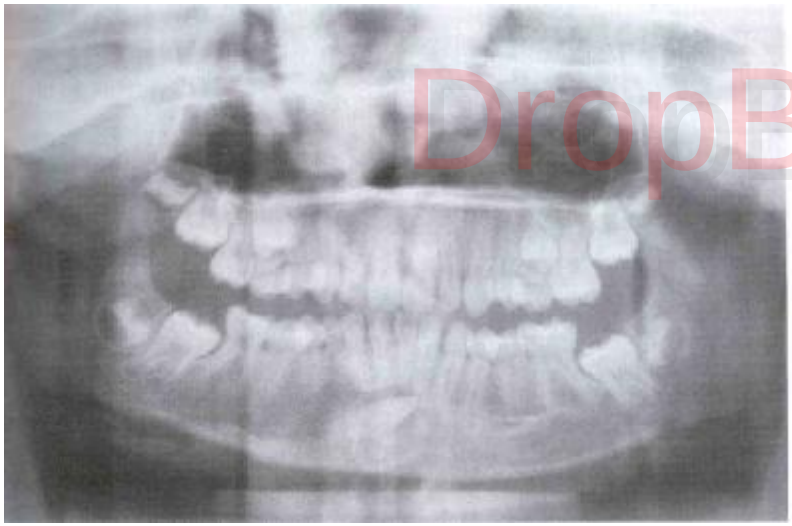
14-year-old female

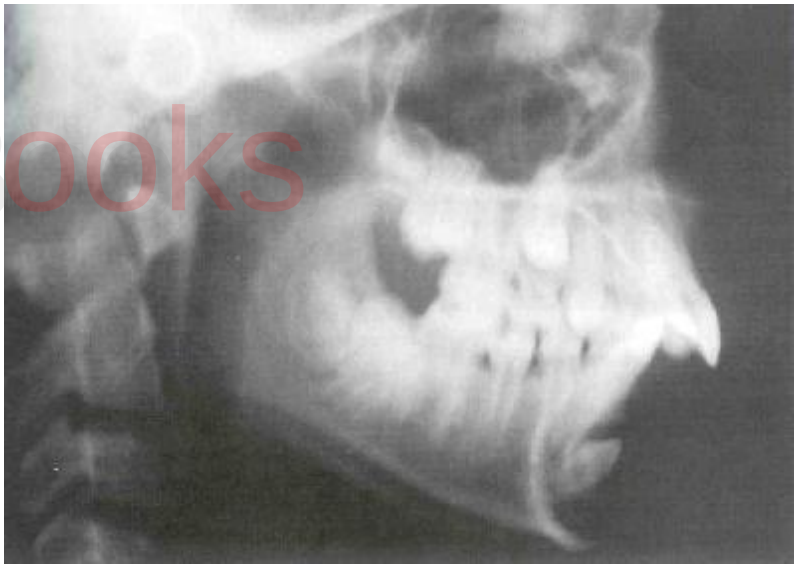


J can dent Assoc 2001; 67:92-6

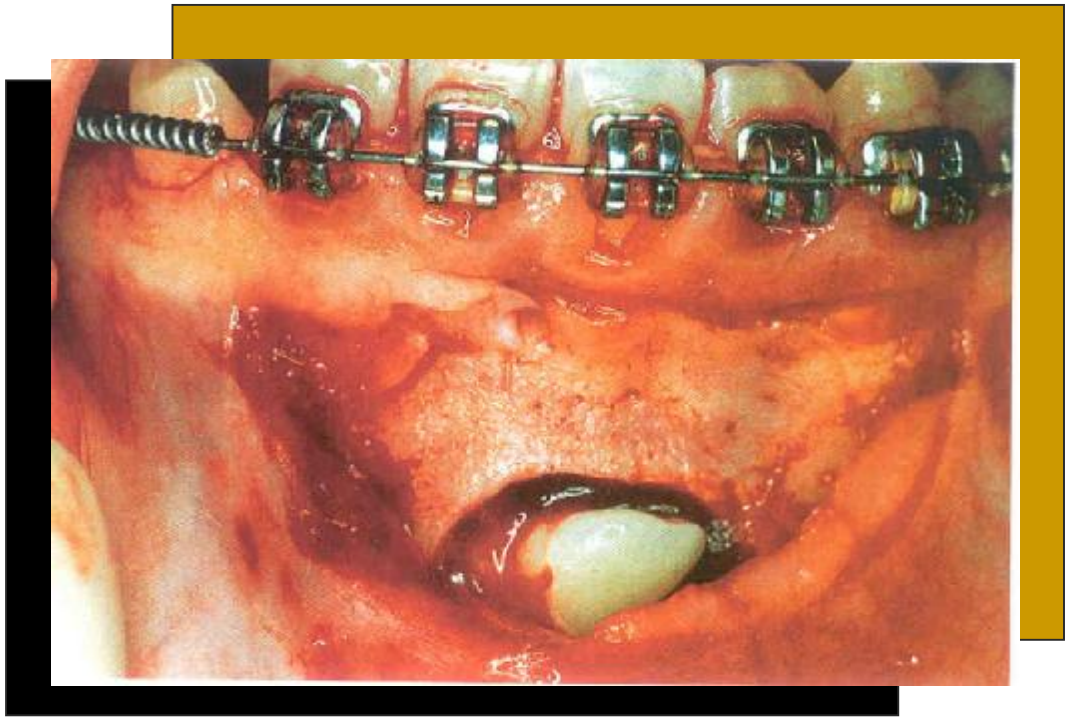
Case 2

11-year-old girl



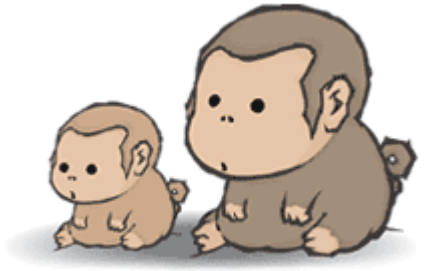


Location of impacted canine



Transplant to its normal position

one week postoperatively



5 years postoperatively

12 years postoperatively

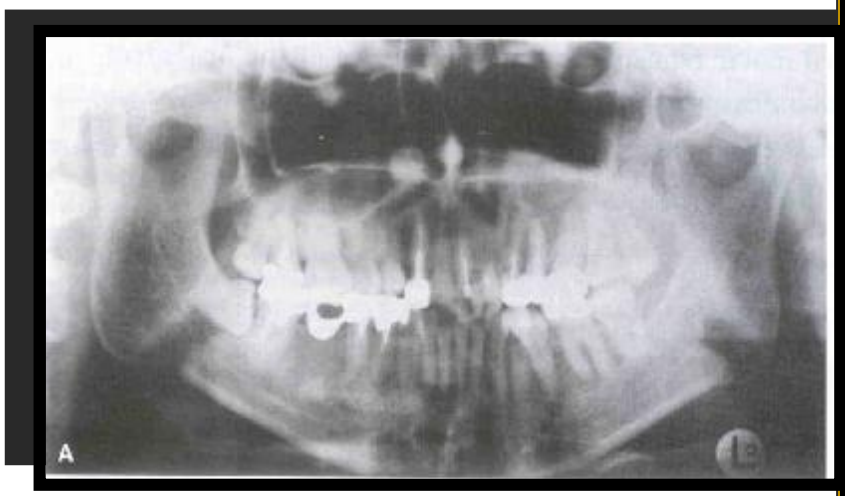
Ioannidou and Markis

from Oral surg Oral med Oral Pathol Oral Radiol Endod 2003;96:582-90

Case 3

Use of third molar transplantation for closure of OAC

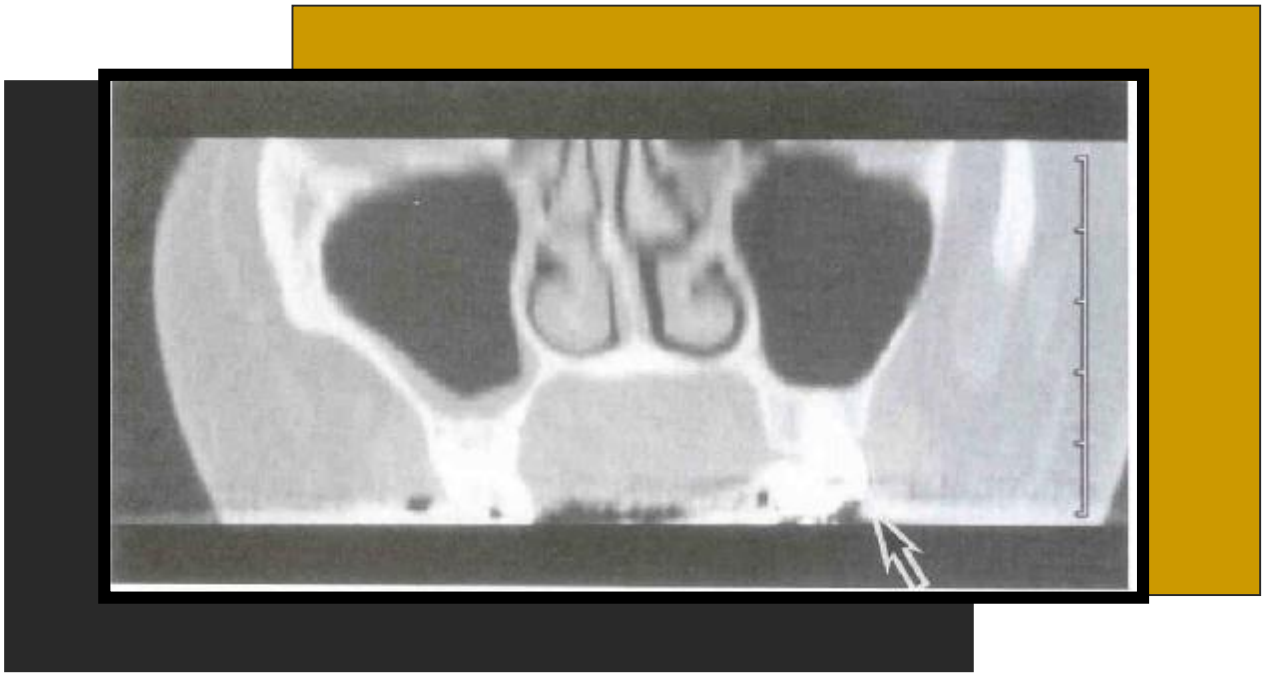
31-year-old female



Immediately after surgery

Two years after surgery

The computed tomograph taken 2 years after surgery



Kitakawa et al
Oral surg Oral med Oral Pathol Oral Radiol Endod 2003;95:409-15


Thank you
for your attention


Special thanks
รศ.ทพ.ทองนารถ คำใจ

Reference

Autotransplantation of teeth,Mitsuhiro Tsukiboshi, DDS, Amagun, Aichi, Japan,2001